Characterization and modification of mesoporous silica nanoparticles prepared by sol-gel

Abstract:

Mesoporous silica nanoparticles (MSNs) were synthesized by sol-gel reaction at normal pressure by using TEOS as a silica source and CTAB as a directing agent in ammonia solution at 323K subsequently calcined at 823 K. Then inorganic pores were modified with metal-supported MSN with attention to the acidity, surface area, pore size, and ability of ion exchange. Crystalline size was shown to decrease up to 20 molar ratios of Si/Al followed by increasing while further adding nanoparticles-aluminium.Moreover, the XRD patterns revealed the mesostructured material for all with 2D hexagonal structure. The obtained results from the XRD patterns were confirmed by using BET and EDX. The BET surface areas revealed the spherical shape for all samples with a decrease in the pore volume and surface area for various AlMSNs which emphasized that the loading of Al and was compatible with XRD results. MSN was prepared by sol-gel methods followed by loading of Al in order to prepare AlMSN which possess strong Lewis acidic sites. Thismodification occurred by using variousmolar ratios of 0, 5, 10, 20, 50, and 100 Si/Al, respectively.TheXRD patterns of various ratios of Si/Al were interpreted in terms of strain, nanocrystalline size, and distribution of the particle size by deriving Wiliamson Hall equation.